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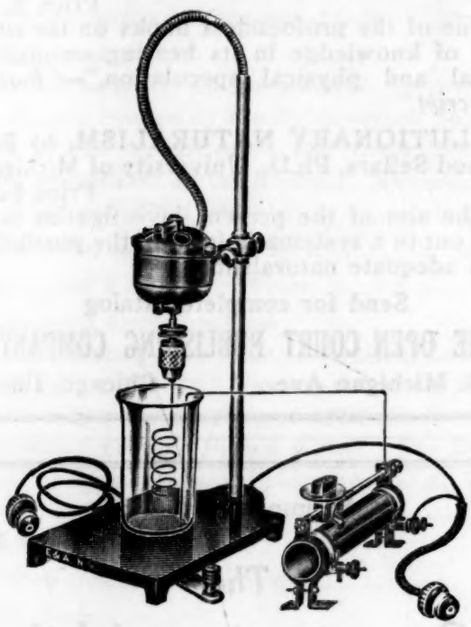

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VOL. LXIII MARCH 26, 1926 No. 1630

CONTENTS

The American Association for the Advancement of Science:
The Intellectual Worker: DR. WILLIAM MACDONALD 317
Problems of a Scientific Investigator: DEAN BYRON CUMMINGS 321
Cooperation in Research: DR. FRANK E. E. GERMANN 324
Eric Knight Jordan: PROFESSOR ALBERT GUERARD 327
Scientific Events:
The International Electrotechnical Commission; An Eastern Section of the Seismological Society; Work of the Committee on the Atmosphere and Man; Expeditions of the American Museum; The Daniel Giraud Elliot Medal 327
Scientific Notes and News 330
University and Educational Notes 333
Discussion and Correspondence:
The Life History of a Fake: PROFESSOR CHARLES W. HARGITT. *The S. T. Darling Memorial Prize:* PROFESSOR TH. MADSEN. *Special Characters for the Typewriter:* EDWARD PIERCE HULSE. *The Distribution of Hymenophysa Pubescens:* B. A. WALPOLE 334
Quotations:
A British Science News Service 335
Scientific Books:
Stratton's Astronomical Physics: DR. RALPH E. WILSON. *Campbell's Bats, Mosquitoes and Dollars:* DR. TRACY I. STORER 336
Special Articles:
Application of the Generic Name of Phyllocoenia: DR. T. WAYLAND VAUGHAN. *A Neglected Capillarity Effect:* F. M. DENTON 338
The American Society for Experimental Pathology:
DR. E. B. KRUMBHAAR 339
Science News x

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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE[1]

THE INTELLECTUAL WORKER

IN an address delivered in New York on December 1, 1925, at the annual meeting of the American Society of Mechanical Engineers, Secretary Hoover deplored the backward state of research in pure science in this country and made an earnest plea for greater financial encouragement of that important form of intellectual activity.

It is unfortunately true [he said] that we can claim no such rank in pure science research as that which we enjoy in the field of industrial research. . . . A list of the awards of the Nobel prizes to men of various nationalities reveals the small proportion of first minds that we support. . . . We have in recent years developed our industrial research upon a scale hitherto unparalleled in history. We have an increase in some ten years from one hundred to over five hundred laboratories engaged upon research for applications of known scientific fact and law. These results have been magnificent. But all these applied science laboratories are dependent upon the raw material which flows from the laboratories and men engaged in pure science, and the industrial investigators are the first to demand more support to pure science. . . . The sudden growth of industrial laboratories has in itself endangered pure science research by drafting the personnel of pure science into their ranks, depleting at the same time not only our fundamental research staff, but also our university faculties, and thus to some degree drying the stream of creative men at the source. Compared with other expenditures of far less importance to human welfare, the amount of money annually devoted in the United States to the aid of investigators and investigation is absurdly small. It is less than one tenth what we spend for cosmetics.

Secretary Hoover might well have extended his criticism and comparisons, had the occasion been appropriate, to other fields than that commonly designated by the term science. The fields of history, economics, political science, jurisprudence and philosophy, in all of which the accepted principles of scientific method more or less apply, show an equal paucity of work of high and fundamental character. The average dissertation which is accepted by American universities in history, economics or political science as a part of the requirements for the degree of doctor of philosophy is often appreciably below

[1] Papers presented at a general session of the association at Kansas City, on December 31, organized under the auspices of the committee of one hundred on scientific research.

the average in quality of the theses presented for higher degrees in Europe, and the study of jurisprudence, as distinct from the technical study leading to the practice of law, may fairly be described as in a deplorable state. We have, in short, a general problem of the recognition and encouragement of intellectual work and the intellectual worker quite distinct from that of the recognition or encouragement of practice and the practitioner, and Secretary Hoover's observations on the needs of pure science research apply with equal force to intellectual work in general.

It is not easy to define with entire precision an intellectual worker. We have, it is to be hoped, passed the time when a hard-and-fast distinction could be attempted between work of the hands and work of the brain as forms of human effort separated by an impassable gulf. The elements of a definition at least, however, may be found in the more or less obvious distinction to be recognized between work which, while by no means dispensing with intelligence or education, is seen to consist mainly in the routine expenditure of physical effort or time, and work in which physical effort or time is incidental to the demonstration of intellectual ability and training. To work of the former class we commonly apply quantitative standards in determining such practical matters as compensation or the value of the product, whereas in appraising work of the latter class we commonly take account primarily of the intellectual quality of the performance. A factory operative, for example, needs a certain intellectual equipment to tend a machine or assist in this or that process, but the intellectual equipment is small, it tends to diminish as mechanical processes become automatic, and the reward of performance is based upon the time spent or the quantity of product turned out. The locomotive engineer requires a higher degree of mind and education than most factory operatives or coal miners need possess, but in his case, too, the necessary training is easily acquired, and the other qualities that count most are limited to suitable physique, experience in performing a few simple and routine operations, acquaintance with a small body of formal regulations, and steady nerves. The time and physical effort expended by an editor or a university professor, on the other hand, in the performance of his routine duties is purely incidental, a sort of unavoidable recognition of the obligations of time and space, and what counts is his intellectual fitness for his task. No editor is paid on the basis of the amount of copy he turns out, or the time and physical effort spent in scanning exchanges or wielding the blue pencil, and no professor's salary is scaled by the number of hours spent in the lecture-room or laboratory or the number of students whose work he supervises. The basis of remuneration in each case is the assumed intellectual ability of the worker to do his particular job.

An application of this element of definition to the problem of determining who are and who are not entitled to be classed as intellectual workers gives us a number of groups, in some of which the intellectual character of the occupation is obvious, while in others the factors of time or practical performance seem almost equally important with that of intellectual ability, and still others are on the border line. The research workers in pure science may be taken as a type of those intellectual workers with whom neither time spent, nor product turned out, nor routine duties performed determine their status or their compensation. With them may perhaps be grouped the administrators of business, the heads of educational or scientific institutions, and writers in various lines. Most professions, on the other hand, show an inseparable union of practice and intellectual content, both of which enter into the calculation in determining the worker's compensation. The intellectual equipment, in ability and training, of the engineer, for instance, is exacting and tends to become more so, but the possession of the equipment is commonly shown in material performance of many and diverse kinds, and it is for the performance, with the presupposed ability to do what is done, that payment is commonly made.

The case of the teacher, whatever his field or the grade of his work, offers an interesting illustration of an intellectual worker of composite status. No one will question that intellectual ability as well as intellectual training are necessities of a successful teacher, but it can not be said that the demands in those directions in American public schools are more than moderate, and the intellectual demands of most college and university teaching are far from high. What distinguishes teaching from other forms of intellectual work, however, is the fact that it tends everywhere to become, save in rare instances, a matter of routine in content as well as in method. Its gradations and compensation are almost everywhere determined by length of service rather than by intellectual ability. Where the tangible is magnified, the intangible tends to recede. It is unhappily possible, in most American colleges or universities, for a professor who has once taken the trouble to master the material of his courses, and who has learned by experience the routine which unfolds with the passing of the academic year, to continue indefinitely as a professor in good standing without adding materially to his knowledge or his intellectual power. What is

true of the college or university professor is still more true of the teacher in the secondary school.

It is not necessary, in other words, that intellectual work shall be of a high character in order to be classed as intellectual. All that is necessary is that the intellectual element in the work shall predominate over what is physical and routine. Tested by this standard the teacher, for example, is certainly an intellectual worker, but he is in most cases an intellectual worker of relatively low grade.

Close to the bottom of the scale, judged by the relative importance of the intellectual factor, we find the varied branches of the "white collar" fraternity who fill the clerical occupations. Salesmanship and accounting, the clerical side of a government civil service, and all the wide range of occupations which involve the keeping of records or giving form to written or printed material, are assuredly intellectual work, each with its special requirements of intellectual equipment. Into the same general category, and entitled to various ratings on the scale of importance, fall musicians and artists, playwrights and actors, reporters and advertising writers, architects, pilots and many classes of foremen or superintendents. The line of demarcation, if it is to be drawn at all, must apparently be drawn at individual or group occupations as determined roughly by the prevailing character of the work done. If the intellectual qualifications are slight and the work essentially routine, the worker may best be classified as a manual worker of a different, but not necessarily higher, grade than one who handles tools or machines. Where, on the other hand, the intellectual qualifications are more considerable, or where increased knowledge or ability, as distinct from mere continued performance, opens the way to weightier responsibility and increased compensation, the work may properly be regarded as intellectual notwithstanding its limited range. The admission of "white collar" workers to trade union organizations is perhaps to be regarded as a recognition of a composite status, either side of which may be emphasized without thereby ignoring the other.

The statistical data are unsatisfactory, but if so-called clerical occupations be included, the aggregate number of persons in the United States engaged in intellectual work of all kinds, on the basis of the census of 1920, would seem to be approximately one fifth of all persons classified by the census as "gainfully employed." Substantially the same proportions appear to hold for many European countries.

What, now, is the present economic status, and what are the apparent prospects, of intellectual work in this country? Reference has been made to compensation. It is true that man does not live by bread alone, but he can not well live without it, and for most practical purposes what the community pays for work of any kind, whether directly in wages, salaries or fees, or indirectly in the provision of facilities or opportunities, affords a pretty accurate indication of the esteem in which the work is held.

At this point generalizations based upon statistical averages must be used with caution. Intellectual work, leaving aside the clerical or other occupations which may perhaps be regarded as on the border line, appears to be too varied to admit of saying positively that it is as a whole either over or under paid. With such wide diversity as exists between the surgeon who receives a thousand dollars for a single operation, a lawyer who asks a thousand dollars for every day spent in court, or a popular author who is paid forty or fifty thousand dollars in royalties for a single book, and professors who scramble eagerly for chairs with a beggarly stipend of two thousand or less a year, the law of averages does not hold. It is safer to deal with specific groups.

In law and medicine, where professional solidarity is highly developed and a legal monopoly of practice is accorded by the state, custom and professional ethics may sanction a uniform scale of minimum charges for specified services, with higher fees based upon the reputation of the practitioner, or the money value involved in the case, or the real or supposed ability of the client to pay; but even here, in spite of the very large rewards obtained in a few instances and of utterly extravagant rewards occasionally demanded in others, the average annual earnings in the profession as a whole are probably less than those of certain skilled manual workers. Substantially similar conditions appear to obtain among architects and engineers, or the tendency at least is in that direction. The average annual earnings of clergymen and professors are notoriously low, not seldom lower than a decent standard of living requires, and many writers, artists, musicians and actors are unable, with long hours and hard work, to earn as much in a year as a metropolitan city pays to its firemen and policemen. Most learned books do not sell enough copies to much more than repay the costs of publication and distribution, and the royalties would hardly keep the learned author in jeans. Very few scientific journals are able to pay their contributors, and most of them could not exist at all without some form of subsidy.

Certain other conditions characteristic of the field as a whole invite comment and reflection. The exceptionally large rewards occasionally reaped by exceptionally gifted or peculiarly fortunate intellectual workers appear to have little, if any, effect in raising the rewards of the great mass of the less gifted or less fortunate. For the vast majority of intellectual workers the money reward is extremely small,

the lower levels being occupied by clergymen, reporters and space-writers for daily newspapers, and college or university teachers below the higher professorial grades. The increase in salaries or other regular forms of compensation during the past two decades appears to have been much less, both absolutely and proportionately, than the increase in wages accorded to both skilled and unskilled manual workers. If the cost of living, as determined by index figures or statistical averages, be taken as a standard, it is probably true that the economic position of the great majority of intellectual workers in this country is appreciably worse to-day than it was before the World War, and this notwithstanding an increase in national wealth which has made the United States the wonder of the world. An exception is perhaps to be found among public school teachers, whose salaries, at least in the larger city systems, have shown substantial gains over living costs.

Evidences of the disastrous effects of an absurdly low level of compensation for intellectual work are to be seen on every hand in the changing character of the intellectual personnel and of the work actually performed. It is not to our credit as a nation that the intellectual quality of the clergy and the university professoriate should be undergoing a progressive deterioration, that the lure of better-paid applied science should draw young men from the less well-paid work of research, or that the higher forms of creative or critical work in literature, history, economics or jurisprudence should languish because of limited opportunities for remunerative publication. No one, it is to be hoped, will be so foolish as to imagine that a mere increase in money reward, however considerable, would of itself be sufficient to better the situation, and there are doubtless a good many intellectual workers in routine occupations who are paid even now more than they are worth, but unless the material rewards of intellectual effort and accomplishment bear a more rational relation to the social value of the service than they do in the great majority of cases now, we have nothing to look forward to but a continuing decline in the quality of our national culture and increased popular contentment with an existence whose chief virtue is its mechanical efficiency.

The supreme test of the intellectual life of a community is the importance which it attaches to research and creative intellectual effort. Unless research, in whatever field it may be carried on, is held in high esteem, with adequate facilities for its maintenance and adequate rewards for the men and women who devote themselves to it, the development of applied science in all its forms will eventually be checked. Sooner or later, unless research continues, we shall reach the end of the things that are known, and then progress will cease. What is true of research is true of creative intellectual performance: it must be magnified or intellectual life will decline. What can be done to avert such a calamity, and to give to research and intellectual creation the place of honor which they ought to hold in our intellectual and social life? I venture to offer one or two practical suggestions.

The first is the cultivation of a more effective spirit of solidarity among intellectual workers as a whole. Within the ranks of certain professions, notably law and medicine and increasingly among the various classes of engineers, professional solidarity is already more or less highly developed, and the weight of professional standards and professional influence is likely to be thrown in support of individual members of the profession in their practice as well as in support of undertakings important for the profession as a whole. Something akin to a trade union movement has already shown itself among public school teachers, architects and civil servants in this country, and among journalists, lawyers' clerks, scientists and authors in Great Britain and a number of continental countries. Whether or not a trade union organization of intellectual workers is desirable or feasible is, of course, an open question. What is both desirable and feasible, however, is a wider recognition of unity of spirit and aim. Problems and methods differ with subject-matter, but the temper which supports and honors research in one field contributes, directly or indirectly, to its advancement in others. The physician is neither a chemist nor a physicist, but he is as independent upon the discoveries of the chemist or the physicist for the successful treatment of disease or injury as he is upon the manufacturer who prepares his remedies or the artisan who fashions his appliances. Nearly or remotely, what concerns one concerns all, and if the legitimate needs of any one class of intellectual workers were assured of active moral support in every other class, less complaint would be heard that the needs were not met.

In the second place, we can insist that the line be drawn—much more clearly than it is commonly drawn at present—between teaching and research in universities and special schools. Taken as a whole, the existing situation at this point is chaotic. Scholars who might add materially to the sum of knowledge if they were given a fair chance, and whose obvious place is in the laboratory or the library, are spending the larger part of their time and energy in teaching undergraduates; professors whose forte is teaching are going half-heartedly through the forms of research; courses of study ostensibly designed for graduate students are open also to undergraduates, often with the result of meeting the needs of neither class; and students whose mental development will

never pass beyond the assumed level of junior or senior year are encouraged to seek a doctorate in science or philosophy. It is time that such disorder were ended. Systematic teaching is not research, neither is it creative intellectual effort, and the type of mind that excels in the one is rarely found excelling in the other. It is not so much a question of higher or lower, as it is a question of difference, and a clear recognition of the difference by university faculties and governing boards would go a long way toward giving to American university life an intellectual character which it now too often lacks.

A final suggestion is drawn from the point stressed by Secretary Hoover in the address already referred to. We need a far more ample endowment of independent and unfettered intellectual work of every kind. We still lack an adequate provision of research laboratories and libraries, research professorships, fellowships and other foundations, and avenues of publication of the fruits of original and independent investigation or thought. We need these things, both within and without the university. The low level of intellectual interest which obtains in most American universities is not likely to be raised by increasing the endowments for undergraduate purposes. The level will be raised only by establishing pure learning upon a firm and ample basis, and conceding its primacy among all the things for which a university exists. There is equal need of independent foundations, dissociated from any university, national in scope and unhampered by ancestral or geographical obligations. We might have had the needed endowments long ago if intellectual workers, recognizing their solidarity, had unitedly asked for them; we can have them now whenever the workers are prepared to use them and ask for them with common voice.

WILLIAM MACDONALD

YALE UNIVERSITY

PROBLEMS OF A SCIENTIFIC INVESTIGATOR

AT no time in the history of civilized countries has there been so much time and money spent on scientific research as now. Governments are maintaining an army of men and women who are delving into every phase of our economic and social life, opening doors to new avenues of development and endeavor. Our great corporations are equipping laboratories and employing specialists to study the problems with which they are confronted and blaze the trails along which they can reasonably expect to press on to the accomplishment of greater things in increasing their winning capacity and in enlarging their fields of operation. Scientific societies are husbanding their resources that they may add to the world's knowledge and the world's power by turning their searchlights upon the clouds of superstition and ignorance that still hover about men. All this augurs well for the future; and if undue pressure is not brought to bear upon these research workers to make their results count in certain special directions and they are not unduly pressed for time, conclusions will be reached that will not only aid in the development of our national resources but will solve many of our social and economic problems and enhance the peace and happiness of the world.

The great publicity given recently to the exploiting of Tutankhamen's tomb in Egypt and the rifling of the dinosaur nests in the Gobi desert have awakened a general popular interest in archeological investigations to such an extent that nearly everybody in our part of the country is hunting for a buried city, a lost mine or a hidden treasure. To capitalize this awakened interest and secure therefrom results that shall be permanent and worthwhile is the task of the biologists and anthropologists of to-day. But to meet the popular demand for sensations and avoid wasting precious time, energy and money is no easy accomplishment in these days of Sunday sheets and sensational scientific exaggeration. Research workers are in great danger of giving this popular demand for something striking, something unusual, too much heed. It is a great temptation to shake one's plumage and cluck instead of sitting on the nest till the eggs are hatched, and we may be able to determine with some degree of accuracy the character of the offspring.

If we would dignify our profession and make permanent results the goal to be attained, we can not afford to fan the sensational flame. The modern craze for advertising is making us forget professional ethics and personal justice. A short time ago an investigator sent some rubbings of a few Hebrew inscriptions found on some lead crosses and swords near Tucson to a celebrated Hebrew scholar in one of our large educational institutions and asked for an interpretation of their significance. He received a courteous letter in reply, stating that he could translate nearly all the inscriptions and requesting that full information regarding the articles and full text of all Latin inscriptions and other symbols be sent him and that he be permitted to prepare a paper for some scientific society on the finds; but the letter contained no translations of Hebrew symbols. A few years ago an archeological worker spent an entire summer of great hardship in a remote region of northern Arizona and was fortunate enough to find several large cliff pueblos before unknown. A brief account appeared in the local papers. Forthwith an official archeologist made a hurried trip to the region,

spent two days among the ruins and in an unusually short time a hurried bulletin of the department appeared as a preliminary report on the remarkable ruins of the hitherto unexplored region with no acknowledgment of the locally published facts. The results of a hard summer's work had been forestalled.

There is so much work to be done in every field and especially in the field of American archeology that there is no excuse for the duplication of work. The problem of the origin and relationships of the American cultures will never be properly solved until there is a greater collaboration of results on the part of the investigators in the various fields. Full investigation and careful tabulation of results has too often been retarded by the storm of ridicule and abuse that has been heaped upon the heads of those who brought to light anything unusual. Some of our leading anthropologists have condemned without a hearing facts that are really incontrovertible, and good men have been hounded from the profession by others who happened to hold the center of the stage at the time. A few years ago some U. S. geologists were making investigations in southern Arizona. One of them was kind enough to address the faculty and students of the University of Arizona on some skeletal remains of the mammoth that had been found in our country. At the close of the address the writer of this article suggested to the speaker that it would be fine if he and his associates would continue their investigations in this old lake bed until they uncovered some fossil remains of man. The answer came back quick and straight: "Not on your life! If we find any human bones in those fossil beds, we'll bury them instanter, pack our luggage and ask to be transferred to some other locality. We are not going to risk our professional reputation by finding any Pleistocene man." It seems a crime to some to bring to light anything new, anything that contradicts our published theories. Men uncover the bones of Pleistocene animals in California, Arizona and many other places; and the finds are accepted without question; but if a human bone or implement is encountered in the same or similar strata, their presence must be accounted for in some other way. Primitive crania are found in the ancient caves of the arid plateau of our Southwest and encountered in Mexico thirty feet below the surface, buried eighteen feet beneath an ancient lava flow; but the chins of these crania do not accord in form and line with the Neanderthal type in Europe, and therefore can not be primitive. It matters not that the ruins of a different and yet prehistoric people lie above them and the dust of ages envelops them. It matters not that eighteen feet of gradual deposit, twenty feet of lava and two feet of surface soil lie above them. They do not conform, and therefore can not be right. In fact "conform" seems to be becoming an educational as well as ecclesiastical requirement in our national life. Unless we travel in the grooves made for us by our self-appointed superiors we must get off the highway. We have no place either on or behind the bandwagon. We must follow the crowd and become a rooter or the manager of the show will publish us to the alumni and brand us as traitors. Too often the scientific worker finds himself backed against a wall and his hands tied because the results he is reaching do not satisfy some one in the superior council or some pet patron. Plans are changed, funds are withdrawn, results are questioned and a blank corporate stare greets the investigator instead of the smile of human interest and cheer that he had a right to expect. He must work out some one's pet theory or serve some one's greed or his work is not worthwhile.

The publication bug sometimes takes possession of a worker and he gets the mania to see his name on the front page of as many volumes as possible. The English and the Germans are quite prone to estimate scholarship on the basis of published pages and tomes; but may the gods forbid us to ever estimate the true scholar on any other basis than that of real contribution to human knowledge and welfare. Institutions also sometimes make the mistake of insisting on volume in publication, and research workers in many of the experimental departments of the government and its allied institutions are expected to produce one or more bulletins at stated intervals. It seems not a question of having something to say and then saying it in the best possible manner, but rather a question of vocabulary and ability to make the reader believe you have something to say and that you will say it if he'll read long enough. Such publications kill faith in the research worker and his results, and flood the country with worthless trash that throws discredit upon every sincere and honest investigator.

The great essential for the successful prosecution of research is a feeling of ease and tranquility. The mind must be able to attack the problem in hand fresh and untrammeled. He must be able to study his problem from every point of approach without carrying to his task the worries of daily existence. Happy the man who is able to close the door of his laboratory, shut out all petty perplexities and concentrate every power of intellect and physical endurance on the clear interpretation of his problem. To attain this peace of mind he must have adequate equipment and help to carry his investigations to successful conclusions. Ofttimes much valuable time is wasted and imperfect results attained because a false economy withholds the proper equipment and support. No more can the investigator put his best

into his task if a meager salary necessitates constant scheming to meet the needs of a healthy, growing household. The facts brought to light by scientific investigators are constantly adding to the world's knowledge, pointing the way to the development of latent resources, enhancing the welfare of communities, improving methods of operation and increasing the wealth of institutions, corporations and individuals. Should such workers be forced to pinch and save and ofttimes do outside work in order to live decently and educate their families? Worry and uncertainty kill more men than does hard work and they also impair and often nullify the services men could render mankind if only they could devote their whole energies to the work in hand. Adequate compensation is due to the investigator not only because he deserves it and needs it, but also because he earns it. It is a fine thing to sit in the back row in silent complacency and hear the men on the platform laud the increased knowledge and wonderful benefits to industry, science and human welfare brought about by your years devoted to research. That is the highest reward any man may hope to attain; but it does not save a wife from overwork or educate sons and daughters. Halos have ceased to be in style and bronze wreaths are considered poor compensation. Salaries inadequate to meet the needs of comfortable living to-day and funds insufficient to carry projects to a successful conclusion are the great bane of successful research.

To have to lay aside a project or problem because one's time is needed on something else or there are no funds to meet the expenses on this undertaking is poor economy and dissipates time and energy. Too often the research worker in our institutions, in order that he may not become fossilized and that he may be kept alive by contact with "the alert and growing minds of undergraduates," is required to carry a teaching program and do research in his vacant periods. Such conditions are sometimes the result of unforeseen circumstances but render the best results impossible. Adequate salaries for research workers, adequate funds to meet the expenses of projects and sufficient time to carry the problem to completion are great essentials for scientific investigators. Should these essentials be denied? Have not the results attained warranted this support?

Adequate time must be allowed for the summarizing of results and the preparation of manuscripts for publication. If the work is hurried, the investigator is sometimes forced to draw conclusions that more time for wider reading and a fuller comparison with others' results would have avoided. How many times a worker longs for a book that his resources do not permit him to secure or for the opportunity to confer with a worker in some other part of the country, but funds are lacking with which to make the trip. We do not plead for extravagance, but we do plead for efficiency and more constructive results.

In our own field most of the investigators seem to be working at random rather than toward some definite goal. Each worker seems to be trying to cover the whole field of American anthropology by himself or else he is confining his study to some particular locality and time and losing sight of the relationship his work bears to that of the workers in other localities and periods. Volumes and more volumes have been produced, and we have much valuable information on physical anthropology, and on the religious and social organizations and the arts and crafts of many different groups of the American race; but little has been done to assemble and correlate that information and render it available to the majority of interested men and women.

What is needed is a central headquarters where men and women of experience and broad education might act as a clearing house for the results obtained in the different branches of the field of American anthropology. Such a group, with ample library facilities at hand, and working under a directing head and following out a well-defined policy, could render invaluable service to men in the field and assemble results so that greater progress might be made in the study of the American field. What is needed is a comprehensive policy and plan with all efforts directed toward the goal to be achieved. Why can not the Bureau of Ethnology or the Carnegie Institute become such a clearing house in anthropology? To map out a definite policy and lay down a comprehensive plan of operation under which all investigators might work is a task worthy the best efforts of our government or of any institution endowed for scientific research. We are now drifting. Let us get a broader vision and work constructively toward a bigger, higher goal. Is it not a disgrace to us that we are not working under a definite policy whose objective is the comprehensive collaboration of the investigations carried on in America and the solutions of the problems of the origin, development and civilization of the native Americans? Let us no longer follow impulse; but rather let us formulate a plan and adhere to a policy of a comprehensive solution of our Indian problem both past and present.

Then, to summarize, we would respectfully suggest that greater efficiency in operation and a far larger degree of successful results would flow from:

(1) Complete devotion to the problem in hand.
(2) An ethical attitude toward the work of other investigators.
(3) Constructive and manly criticism of results.
(4) Adequate funds to provide equipment and prosecute the task in hand.

(5) Sufficient time to reach stable conclusions.
(6) Living salaries for workers.
(7) A central organization to aid investigations and correlate results.
(8) A definite and comprehensive policy.

BYRON CUMMINGS
UNIVERSITY OF ARIZONA

COOPERATION IN RESEARCH

RECENTLY while driving to Enfield Falls, near Ithaca, N. Y., I passed a man trying to push a heavy sedan out of a ditch, where the rear wheel had securely lodged itself. My companion and I returned and offered to help him. We went behind the car intending to push while the owner of the car would pull with his engine, but to our surprise, he also placed himself at the rear intending to help us. Not until I suggested that he could do infinitely more good at the wheel did he realize that pushing alone would never dislodge him. Jumping into the car, he had scarcely started the engine when he was on the road again.

We have here a striking example of two types of cooperation, as well as an illustration of their respective merits. Had there been sufficient help, pushing alone would have been enough, but how much easier it was for us all as it was done. Pushing alone might be regarded as cooperation among men of the same science, whereas pushing and pulling together might be regarded as a cooperation between allied sciences. Although the latter offers the richest rewards, yet in practice it is the most difficult to bring about. It is being done on the industries, but, unfortunately, few workers in our universities have attempted it. Some who have tried it have met with failure, because the companion scientist was not interested. President Farrand, in his address of welcome to the delegates of the Optical Society of America on the occasion of their recent meeting in Ithaca, deplored the existence of departments so highly specialized as to offer a real problem in administration. He no doubt referred to the feeling on the part of a given science that it was the most important, and that its annual appropriation was of more consequence than that of another science.

For convenience we may classify cooperation under three headings, namely, among men in the same science, among men in allied sciences, and cooperation in the form of loaning apparatus.

We may further subdivide cooperation among men in the same field into three classes, that between men in the same department, between men in different institutions, and between the universities and the industries. In the same way we may classify the second type of cooperation, that between different sciences, as cooperation between different departments of the same institution, either university or industry, and between university and industry. Cooperation by means of apparatus may take various forms. It may consist of an outright loan, or permission to use apparatus without removal. The industrial worker might be given access to the university laboratories for trying out new methods on a small scale, while the university worker might be given access to the industrial plant for large-scale experimentation.

Let us first consider the possible drawbacks. As a rule, we would probably find that pioneer work in a field such as that of Maxwell or of Gibbs would not lend itself to cooperation, because of its being a generation ahead of the rest of the world. Still we must recognize the existence of such work as the Michelson-Morley experiment, which was in reality the highest type of cooperation between scientists in allied fields. Most of our cooperation must however needs be along the line of working out details of known phenomena.

We would also no doubt find that we would become more specialized than ever, and as a result, less capable of carrying on independent research. This is indeed the tendency in some of the large industrial laboratories, although fortunately not in all. As a rule it is considered best that the men know little beyond their own particular problem, since in that way trade secrets are not so easily lost. This may seem a bit exaggerated, but I need only say that recently I wished to be better posted on a given scientific process and wrote to the director of one of our large industrial research laboratories, which used the process, for the latest literature references on the subject. He referred me to several books some fifty years old, but said that they were not up to date. The up-to-date methods they kept as trade secrets. And yet that laboratory is publishing the results of scientific research continually!

No doubt many of us have had the unpleasant experience of telling a fellow scientist about some unpublished results, only to find a little later that he has appropriated our ideas and has published them ahead of us. This does not happen often, and would be even less if we as teachers would mention the evil to beginners in research. It usually occurs in the case of the younger element only, so that it is not a very serious drawback to cooperation.

Regarding the borrowing of apparatus, it may be said that borrowing a thing we can not afford to buy is a procedure which might prove embarrassing. When a lack of money is not the motive in borrowing, but rather a desire to use something only for a short time, then it may prove of great value. In any case, it would seem more advisable to use apparatus without removal to another place, as one would thus have

less danger of accident, as well as the help of some one possibly better versed in its use.

Turning now to the advantages of cooperation, we find there are many. First and foremost, it has been definitely proven by the success of the large industrial research laboratories that scientific progress is much more rapid when many workers are busy under the direction of a competent head, all working toward the same goal. Every man's time thus counts for the most, as he is only doing what he understands best, turning problems out of his field over to his fellow workers. Right here is where the greatest difficulty arises in the case of academic men, as here there is no research head, the very system demanding absolute academic freedom. Any cooperation among university men must be absolutely spontaneous, if it is to succeed. We can not tell Mr. A to cooperate with Mr. B, but we can educate all scientists to the benefits to be gained, and thus increase the probability of spontaneous cooperation.

Some years ago while attending a national convention, I recall two scientists getting into a very heated argument while discussing the results of a paper which was under consideration. After the battle of words assumed alarming proportions, a peace-maker rose and suggested that if these two gentlemen would only go to one or the other laboratory and try out their ideas together, they would be able to come to an agreement. Thereupon the younger of the two men rose and said, "We used to be in the same laboratory and could not agree, so that is impossible."

This was, of course, the unusual case. In fact some of the greatest benefits have come from just this sort of cooperation. When two scientists are at variance as far as experimental results there is no better solution than actually packing up and going to work under the same conditions as the other man has worked. It usually develops that both are right and that both could make better headway by a continual exchange of ideas. Moreover, in place of a rather strained feeling, they will have substituted mutual respect.

A summary of events leading up to a recent scientific expedition may serve to bring out some of the results which may be looked for in truly cooperative work. There was at one time a theory that flowers were beautifully colored in order to attract insects, with the ultimate idea of cross-pollenization. This was a fine theory which would have satisfied us to-day, had it not been for the fact that some one came along and proved, to the satisfaction of all concerned, that insects were color blind. Not long ago it occurred to a biologist, who knew of the existence of light waves beyond those visible to the human eye, that possibly it was due to our own egotism that we called the insect color blind. Might it not be that insects have a range of vision in the ultra-violet, just as we have in the visible spectrum? Might not two flowers, one red and one blue, both give out the same group of wave lengths in the ultra-violet, and thus be identical in color to an insect seeing only the ultra-violet? Moreover, what is to prevent two different kinds of red flowers from giving out two entirely different sets of wave-lengths in the ultra-violet, and thus appearing to have entirely different colors to an insect? Thus a given type of insect might in reality only be visiting flowers of the same color as far as it was concerned, while to us it appeared to be visiting flowers of all colors.

In order to test out his ideas, the biologist bottled up some flies and took them to his friend the physicist. The flies were placed in a quartz tube so as to permit the ultra-violet rays to enter, and the tube placed end on near a source of ultra-violet light. Light filters were used so that only rays invisible to the human eye entered the tube. In the words of the biologist, the flies went towards the source of ultra-violet light like Quakers to a camp meeting.

Having proved that at least one kind of insect sees light that we do not see, it remained to study the ultra-violet radiations of flowers in their native habitat, and to get positive information concerning what flowers a given insect visits during the course of an hour.

An expedition was organized to the Rocky Mountains and the University of Colorado was made the seat of operations. As a rapid means of learning where an insect had been, it was decided that the pollen on the legs would be a good index. Investigation disclosed that no microscopic study of pollen had ever been attempted, so one research worker was assigned this task. A very excellent piece of work was the result, so that it is no longer necessary to follow an insect over a Rocky Mountain landscape in order to know where it has been. The ultra-violet spectrum of flowers in their natural positions was photographed, and although no very striking results were achieved, yet it was perfectly evident that flowers do have their characteristic ultra-violet radiations.

Unfortunately, the work was dropped at this point, at least temporarily, but the ramifications of the subject would here as in all other work have been endless had it been continued. One subject which would have come in for early consideration would have been the question of odor and the sense of smell. Its study would have required the combined efforts of physicists, biologists, chemists and psychologists.

As has been mentioned before, there is frequently a false concept of the relative importance of one or another science. Nothing could do more to dispel such notions than rubbing elbows with fellow scien-

tists while attempting jointly to work out a given problem. Nothing could do more to develop a friendly feeling and a spirit of helpfulness than to learn that each science is straining every nerve in order to place it in possession of more facts and more fundamental truths.

Regarding cooperation between university workers and the industry, it may be stated that the industrialist on the one hand has often felt that the academic worker was not interested in his problems, and was not of a practical turn of mind. This is in fact frequently justified, but could at times be easily remedied. Any scientist who will but take the time to spend an hour or two talking with an industrialist will shortly find that he is very deeply interested. The interest will be real, because he will see that the problems are his problems, and that he could offer many valuable suggestions, and be of real service to the world, without undue effort on his part. He will see a possibility of increasing his income as well as increasing the esteem in which he is held by the community. The industrialist on the other hand will learn that he must actually approach the scientist with his problems and thus lead him on.

One result which would thus be at least partly achieved would be that the industries would learn to know that what academic workers are doing will, in the long run, be of financial benefit to them. They will learn to realize that although X-rays and the rare gases of the atmosphere never netted the discoverers anything, yet they have helped increase the dividends of more than one industrial corporation. It might be hoped that as a result the industries would be more liberal in their gifts and thus more actively subsidize research.

The layman, seeing the university worker helping the industry, would no longer look upon him as a man who only loved to "play" in his laboratory. This would do much to increase confidence in our schools and lessen opposition of the people to the money spent by our state institutions of higher learning.

In short, if science is to advance more rapidly than before, we must learn to advertise our wares in our home communities as well as before our scientific fellow workers. Such books as "Creative Chemistry" have done wonders in this regard, and Science Service is carrying the work on in an admirable way, but we must all do our share to help.

I often tell my classes that mathematics is possibly the science nearest to being self-contained. The mathematician often fails to realize that his science was created and developed by astronomers and physicists. If a physicist knows mathematics, he can regard himself as having covered his field. He must, however, realize that his science has been greatly enriched by the chemist, who centuries ago wanted to know more about the atom. Thus the chemist must know physics and mathematics before he is complete.

The geologist should know all these subjects in addition to his own, but the task is too great. The same is true with the science of medicine. Just as the physicist and chemist appreciate that they must know the underlying sciences, so also the mathematician, physicist and chemist should realize that they should reach out and help those struggling in the more complex fields such as geology and medicine. The professor of mathematics or physics should not only have his students solve problems, but should also be able to give them an intelligent interpretation of the physical or chemical problem which is under discussion. Cooperation between scientists will not only make this a pleasant task, but will also serve to make the teacher more inspiring to his students. The task will no longer be one of mere form, but there will be a definite object in view.

The sum total of scientific knowledge is so great to-day that no one person can hope to know well more than a small portion of any science. Fifty years ago it was still possible for a man in his lifetime to master several sciences and to make noteworthy contributions to each, but to-day men of that nature are very few. Since all science is interrelated, it is not possible for any one problem to be satisfactorily solved by one man alone. Obviously the greatest need lies in the direction of cooperation between men of allied sciences, such as between chemistry and medicine, between physics and chemistry, chemistry and geology, etc.

There is also need for a better understanding between the industries on the one hand and the pure academic sciences on the other. We in the universities sometimes feel that our chief duty is to furnish men who may go into the employ of corporations and solve their problems for them. However that may be, we must not forget that there is still another mission which we have to fulfil. That mission consists in discovering and making available the raw materials with which the industry works. By this is meant that before we can have a factory making X-ray tubes, we must have had Professor Roentgen working for very low wages in a university laboratory. Before a large chemical plant produced radium, we had Mme. Curie working under similar conditions. Before we could enjoy our modern tungsten lamp, we had to discover, isolate and learn the properties of the metal tungsten. This kind of work has in the past and is still largely being carried on in university research laboratories during the spare moments of professors who are usually accused of not having a practical turn of mind. These same professors would very often be of

material service to the industry, if some way could be devised to bring them together. After once having established this friendly relation, the question of the industries helping to finance pure research will take care of itself. In some cases it will take the form of research fellowships, in others that of the endowment of one or another teaching or research professorship. Now it might be a gift of a building and again that of a piece of apparatus which the university could not afford to buy.

Progress to-day is very rapid, but we must not forget that we owe much to those who carefully laid the foundations without thought of reward. One discovery follows another so rapidly that it is hard to keep abreast of the times. Hardly has the radio become commonplace when we learn that accurate photographs are being transmitted by wire. These advances represent the result of cooperative effort, and anything we can do to encourage cooperation will help make progress in the future more rapid than in the past.

FRANK E. E. GERMANN
CORNELL UNIVERSITY

ERIC KNIGHT JORDAN

1903–1926

ERIC KNIGHT JORDAN, the son of David Starr Jordan and Jessie Knight Jordan, was killed on March 10, 1926, by the overturning of an automobile. He was on his way to a geological survey of the Santa Maria region of Lower California.

In Eric Jordan, a great scientific name gave fair promise of receiving new luster. He was hardly more than a boy when he died, for he had been born in San Francisco on September 27, 1903. But he had already achieved distinction in his chosen field. Before entering the university he had made a considerable collection of mollusks of Lower California and of various shores of Europe, while in a secondary school he had prepared a manual of the mollusks of Lower California. This book, which was never published, contained considerable original work, especially on the Chitons and on the minute snails called Odostomia. His studies on the molluscan fauna of Trinidad Head, Calif., were written at the age of fifteen, and published by the U. S. National Museum.

He was graduated from Stanford University in 1923, with geology as his major subject and zoology as a minor. In 1924, under the auspices of Cornell University, he made a large collection of the fishes from Hawaii. Under the direction of the California Academy of Sciences, he later took part in a geological and biological survey of the Off Shore Islands of Mexico, and also in a survey of the middle portion of Lower California. The reports on these last two expeditions are still unpublished.

His chief publications were: "The Mollusks, Living and Fossil, of Lower California, and Their Testimony as to Climatic Conditions in the Miocene Age"; "A Catalogue of the Fishes of Hawaii, with Account of New Species" (in collaboration with D. S. Jordan); "A Review of the Fishes of Hawaii," based on his own collection in 1924. At the time of his death he was a graduate student in geology and assistant curator in the same subject in the California Academy of Sciences.

He was in the perfect bloom of his young manhood; lithe, tall, vigorous, a lover of the High Sierras. A clear-headed and persistent worker, he was also a born executive and a master of English. His love for biological studies approached genius, but there was none of the abnormal or repellant traits of the "prodigy" about him; his personality remained sweet and winsome. He was married but one month before his death to one of his classmates, a gifted and lovable young woman, Elizabeth Roper Jordan. The grief of his bride and of his parents is too sacred for the intrusion of public sympathy. But the scientific world realizes that heredity and early training under an incomparable master had given Eric Jordan opportunities which were perhaps unique. It is a priceless instrument that has been broken. Laboremus!

ALBERT GUERARD

SCIENTIFIC EVENTS

MEETING OF THE INTERNATIONAL ELECTROTECHNICAL COMMISSION

LEADING scientific men and engineers of America and Europe will attend a ten-day meeting of the International Electrotechnical Commission, which will be held in the Engineering Societies Building, New York, beginning April 13.

This meeting will be the first to be held in the United States by the commission, which functions through national committees representing the technical societies and governments of a score of nations.

It is expected that delegates will be sent by every country represented on the commission. The preliminary and incomplete list of delegates includes the following:

Belgium.—Frans Dupont and M. E. Uytborck.

France.—J. J. Frick and M. E. Roth.

Germany.—P. Schirp, Dr. Rudenberg, P. Strecker, Dr. Fleischmann, M. Kloss and Richard Stern.

Great Britain.—Sir Richard Glazebrook, Sir Archibald Denny, L. B. Atkinson, W. W. Lackie, L. St. L. Penched, Col. F. T. Purves, C. P. Sparks, Sir George Sutton, W. B.

Woodhouse, S. T. Allen, E. G. Batt, S. B. Donkin, A. R. Everest, A. D. Cramb, P. V. Hunter, J. P. Gregory, W. Lee, Lieut.-Col. F. A. Cortez Leigh, R. B. Mitchell, W. Pearson, J. S. Peck, C. Rodgers, T. Roles, F. Wallis and P. Good.

Holland.—C. Feldmann, Mr. Tromp, Mr. Rosskopf and Bellaar Spruyt.

Italy.—G. Semenza (president I. E. C.), E. Morelli, Mr. Ucelli and Ernesto Vannotti.

Norway.—H. A. Mork.

Russia.—Professor Chatelain.

Switzerland.—E. Huber-Stocker, A. Huber-Ruf, Charles Burlet, Antoine Schrafl, H. Zoelly and Paul Thut.

Poland.—C. Drewnowski and Z. Okoniewski.

Spain.—A. Artigas.

United States.—W. F. Durand, F. R. Low, C. O. Mailloux, A. E. Kennelly, C. E. Skinner, F. D. Newbury, E. A. Snyder, A. H. Moore, J. Franklin Meyer, C. A. Bates, N. W. Storer and D. W. Roper.

At the close of the meeting the delegates will tour the United States and Canada, being entertained by local committees in numerous cities, including Philadelphia, Washington, Pittsburgh, Chicago, Detroit, Niagara Falls, Ottawa, Montreal, Boston and Schenectady. The Canadian National Committee will welcome the delegates at Niagara Falls and accompany them to Montreal where a public meeting will be held in their honor.

AN EASTERN SECTION OF THE SEISMOLOGICAL SOCIETY OF AMERICA

AN eastern section of the Seismological Society of America has been formed, with the following temporary officers: *Chairman,* Dr. James B. Macelwane, St. Louis University, St. Louis, Missouri; *vice-chairman,* Mr. Ernest A. Hodgson, Dominion Observatory, Ottawa, Canada; and *secretary-treasurer,* Comdr. H. N. Heck, U. S. Coast and Geodetic Survey, Washington, D. C.

The society is a national organization with headquarters in California. People in the east who are interested in the problems developed by earthquakes have long felt the need of a local section, because the headquarters and activities of the society are on the west coast and eastern members received no benefit except the subscription to the bulletin.

The purpose of the eastern section is to arouse interest in earthquake study from every viewpoint: from that of the business man, architect and engineer and those who benefit by their work, the insurance companies and the insured, those studying the earthquake dangers in large cities, as well as those interested in the study of earthquakes as geologists or seismologists.

This will be accomplished in two ways. A quarterly section bulletin which will list books and articles published in regard to various phases of the earthquake problem and special papers and abstracts. Articles written in the bulletin will be interesting reading for the layman as well as the scientists. An annual section meeting will be held in a different place each year. At this meeting papers which will interest all those mentioned above will be presented.

The first annual meeting will be held in Washington, D. C., on May 1, 1926, at the close of a series of meetings including those of the American Physical Society, National Academy of Science and American Geophysical Union.

Further information regarding the eastern section may be obtained from N. H. Heck, temporary secretary-treasurer, U. S. Coast and Geodetic Survey, Washington, D. C.

WORK OF THE COMMITTEE OF THE NATIONAL RESEARCH COUNCIL ON THE ATMOSPHERE AND MAN

AT its meeting in New Haven on March 7, 1926, the committee reviewed the progress which had been made on several specific researches which the committee initiated several years ago. Plans were made for further development of the data on daily mortality in New York City in relation to weather elements, for the period 1883 to 1888. The analysis which the committee has directed to be made during the ensuing summer may lead to important and definite conclusions in respect to the association between the several conditions of the atmosphere and human mortality. Plans were also reviewed for presenting the essential facts of certain investigations which were made for the committee by representative manufacturing establishments on the effect of indoor and outdoor air conditions on industrial efficiency.

Consideration of these latter records led the committee to suggest that graduate schools of the universities should delegate a number of specific researches within this field to qualified students. There is an evergrowing interest in the effect of atmospheric conditions on health, mortality and efficiency. The interest in problems of ventilation, lighting and in other effective control of indoor conditions was never so strong as it is at the present time. The committee hoped that it might be feasible to pool the interest of hygienists, physiologists, meteorologists and statisticians at the present time, and to present a research program which would unify the many specific endeavors now under way. The public health workers, through the American Public Health Association, have also shown a revived interest in the subject. Economic geographers, industrial hygienists, hospital administrators, psychologists, physicians in general practice and many other groups have

recently ventured into the field. Interchange of plans and experience would go far to effect maximum results from the effort now being expended on research into atmospheric conditions in their admitted relation to health and efficiency.

The committee is planning a definite report in the autumn of 1926 on the mortality and industrial data now in its possession and will then be in position to consider the further encouragement of integrated research in this important subject.

The chairman of the committee is Dr. Ellsworth Huntington, Yale University, New Haven, and the secretary is Mr. Philip Drinker, Harvard School of Public Health, Boston.

EXPEDITIONS OF THE AMERICAN MUSEUM OF NATURAL HISTORY

PRESIDENT HENRY FAIRFIELD OSBORN, of the American Museum of Natural History, has announced that friends of the museum had supplied more than $240,000 to insure the continuance this year of museum expeditions in many parts of the world. The expeditions had been in danger of curtailment for lack of funds.

The following survey of the world-wide activities of the museum has been made public:

Dr. Frank M. Chapman, accompanied by assistants, began working in Panama. He has transferred his operations to Venezuela. One of his party, Mr. Jaques, has been sent to Peru to sketch life among the sea birds of Guano Island.

George H. H. Tate, with Harvey S. Ladew, who is providing the means, is on an expedition which will cover Peru, Argentina and Bolivia in search of mammals and birds.

Erich Schmidt, of the department of anthropology, who has been working under the auspices of Mrs. William Boyce Thompson, has just returned from four months of archeological work in Arizona.

Ludlow Griscom, of the department of birds, has returned from Yucatan, where he was one of the Mason-Spinden Archeological Expedition.

Carl E. Akeley has arrived in Africa and is awaiting the arrival of Messrs. Eastman and Pomeroy, who will accompany him on a long safari to photograph the wild life of Africa and to secure sketches for the physical reproduction of backgrounds of a number of groups planned, or under preparation, for the new African Hall.

Dr. James P. Chapin, of the department of birds, with De Witt D. Sage and Frank P. Mathews, are in Central Africa to collect birds of the sub-tropical zone.

H. E. Anthony, of the department of mammals, together with George C. Goodwin, is conducting a biological survey of Porto Rico and the Virgin Islands.

Clarence L. Hay has just returned after examining ruins of archeological remains in Mexico and Yucatan.

Dr. W. D. Matthew, of the department of vertebrate paleontology, will leave in March to join the Central Asiatic expeditions.

H. C. Haven, with Frederick Limekiller, will go out with the Putnam Greenland expedition to collect the narwahl, seal, walrus and shark. The funds for the undertaking have been provided by Harrison Williams.

Roy C. Andrews has left for Asia to join his party there. They will leave Peking early in April.

Dr. W. G. Van Name, of the department of lower invertebrates, through the courtesy of Mrs. Samuel Sturgis, is making a survey of Pearl Islands off the coast of Panama.

Walter Escherich soon will leave New York to join a party on the Pacific Coast where a search will be made for large specimens of the whale shark.

Dr. Frank E. Lutz has begun preparations for reopening the insect station in Palisades Park.

Earl V. Morris, with A. V. Kidder, will conduct archeological work in Canyon del Muerta.

Dr. Roy W. Miner is planning an expedition to the Bahamas.

Dr. Kempfer is working in Brazil and has recently forwarded his first shipment of bird skins.

Harry Watkins is collecting birds in Peru and the Ollalla brothers of that country have recently forwarded a new and interesting series of birds.

Rollo H. Beck, leader of the Whitney South Sea expedition, will continue his work of ocean collecting east of New Zealand.

Dr. Robert C. Murphy plans to take part in an expedition for the collection of sea birds in the Mediterranean.

James L. Clark, with William J. Morden, of Chicago, will reach Bombay within a few days and from there will search for museum specimens of the rapidly disappearing animal life of India.

Through the courtesy of Arthur S. Vernay, Herbert Lang, of the department of mammals, accompanied by Rudyerd R. Boulton, have been making a collection of mammals and birds in Angola, West Africa. Mr. Boulton has just returned to New York and Mr. Lang, after completing his work in the Cape Colony of British East Africa, will sail from Europe soon. This expedition was successful in obtaining a very large collection, which includes specimens of the rare sable antelope.

Albert Thompson is expected to resume paleontological work in Nebraska this season.

Dr. Deeds, of the department of geology, will continue his work on the clays of the Hackensack Valley.

THE DANIEL GIRAUD ELLIOT MEDAL

No nominations have been received of monographs or books in zoology or paleontology for the award of the Daniel Giraud Elliot Medal for 1925. Consequently, the committee on award has thus far made no recommendations for the year 1925 to the National Academy.

Previous awards of this medal are as follows:

1917: Frank M. Chapman—Distribution of Bird Life in Colombia.

1918: William Beebe—A Monograph of the Pheasants.
1919: Robert Ridgway—Birds of North and Middle America (Part VIII).
1920: Othenio Abel—Methoden der Paleobiologischen Forschung.
1921: Bashford Dean—A Bibliography of Fishes (Volume I).
1922: William Morton Wheeler—Ants of the American Museum Congo Expedition.
1923: Ferdinand Canu—North American Later Tertiary and Quaternary Bryozoa.
1924: Henri Breuil—Les Combarelles des Eyzies.

HENRY FAIRFIELD OSBORN, *Chairman*,
American Museum of Natural History
CHARLES D. WALCOTT,
Smithsonian Institution
FREDERIC A. LUCAS,
American Museum of Natural History

SCIENTIFIC NOTES AND NEWS

THE regular spring meeting of the executive committee of the American Association for the Advancement of Science will take place at the Cosmos Club in Washington on Sunday, April 25. Communications for consideration by the committee should be in the hands of the permanent secretary by April 20.

PROFESSOR A. S. HITCHCOCK celebrated the completion of twenty-five years of service in the U. S. Department of Agriculture by a luncheon at the Cosmos Club on March 4, to which were invited his colleagues in the Bureau of Plant Industry and the National Herbarium, who had also completed twenty-five years of service. The U. S. National Herbarium was represented by Dr. Frederick V. Coville (appointed July 5, 1888), Dr. J. N. Rose (appointed August 10, 1888) and Dr. W. R. Maxon (appointed January 9, 1899). The secretary of agriculture was also a guest.

AN oil painting of William Lochhead, emeritus professor of entomology and zoology in Macdonald College of McGill University, was unveiled on March 17 by Sir Arthur Currie, vice-chancellor and principal of the university. The portrait was painted by Mr. G. Horne Russell, president of the Royal Canadian Academy, on subscription of a large number of Professor Lochhead's colleagues, former pupils and other friends.

DR. H. M. HALL, taxonomist and ecologist of the Carnegie Institution of Washington, has been elected a corresponding member of the Botanical Society of Geneva, for services rendered to botanical science.

DR. HARRY PLOTZ, of the Portius Institute, was recently made a foreign member of the Société de Pathologie Comparée.

OXFORD UNIVERSITY has conferred honorary M.A. degrees on Dr. Joseph Burtt-Davy and Mr. Robert Chrystal, both of the Imperial Forestry Institute, of Oxford.

THE University of Aberdeen will confer the honorary degree of LL.D. on Professor F. W. Oliver, professor of botany in University College, London; Dr. R. W. Reid, emeritus professor of anatomy in the University of Aberdeen, and on Professor T. B. Wood, professor of agriculture in the University of Cambridge.

THE Meldola medal of the Institute of Chemistry, England, was presented to Dr. Henry Phillips at a meeting of the institute on March 1.

THE Barclay Memorial Medal for 1925 of the Asiatic Society of Bengal has, according to *Nature*, been awarded to Lieut.-Col. J. Stephenson, lecturer in natural history in the University of Edinburgh, in recognition of his work as a biologist and as the founder of the School of Zoology in Lahore.

DR. OSKAR VON MILLER, pioneer in hydro-electric work in Germany, was made the recipient of the Grashof medal by the German Society of Engineers on the occasion of his seventieth birthday. The award is the highest order of merit conferred by the society.

PROFESSOR KARL VON DEN STEINEN, Berlin, well known by his anthropological explorations in Central Brazil, and Baron Erland Nordenskiöld, of the Göteborg Museum, have been elected honorary members of the Paris Société des Américanistes.

THE French Academy of Sciences has awarded the Lallemand prize to Dr. Piera Locatelli, assistant in the institute of general pathology and histology at the University of Pavia, for his work on the influence of the nervous system on regeneration processes.

DR. F. A. BATHER, of the British Museum of Natural History, has been elected president of the Geological Society of London.

WILLIAM REAVELL, head of Reavell and Co., England, has been elected president of the British Institution of Mechanical Engineers.

PROFESSOR VICTOR LENHER, of the department of chemistry at the University of Wisconsin, has been appointed research consultant in the United States Army chemical warfare service.

JAMES M. PICKENS, of the U. S. Bureau of Animal Industry, has been appointed editor for the Bureau of Plant Industry to succeed the late J. E. Rockwell.

THE following members of the college of arts and sciences of Cornell University have been granted leaves: Harry P. Weld, professor of psychology, second term, 1926–27; Dr. Earl H. Kennard, assistant

professor of physics, both terms, 1926–27; Carleton C. Murdock, assistant professor of physics, first term, 1926–27; Arthur W. Browne, '03, professor of chemistry, second term, 1925–26.

PROFESSOR LEWIS A. BRIGHAM, of Boston University, has been granted a two years' leave of absence to work at the Lick Observatory, Mt. Hamilton, Calif.

MARY J. GUTHRIE, assistant professor of zoology at the University of Missouri, has been granted leave of absence for the next academic year.

DR. GERRIT S. MILLER, mammalogist of the Smithsonian Institution, is leaving for the Gulf of Mexico on a collecting expedition to obtain specimens for the U. S. National Museum.

DR. WILLIAM TALIAFERRO, associate professor of parasitology at the University of Chicago, accompanied by Mrs. Taliaferro, will leave early in April for Honduras, where they are going for the purpose of making a scientific study of malaria.

DR. ALEJANDRO CEBALLOS, associate professor in the Medical School of the University of Buenos Aires, has been visiting medical schools and hospitals in the United States.

DR. F. WOOD-JONES, professor of anatomy in the medical school of the University of Adelaide, Australia, is visiting the United States.

THE Hooker lecture of the Linnean Society will be delivered this year by Professor Carl Schröter, foreign member of the society, of Zurich, on April 15, and will be entitled "The Swiss National Park and Scientific Researches into its Nature."

THE sixth biennial Sydney Ringer lecture was delivered at University College Hospital Medical School by Dr. G. V. Anrep on March 4 on the subject of the regulation of the coronary circulation.

PROFESSOR MAX BORN addressed a joint meeting of the Philosophical Society of Washington, the Washington Academy of Sciences and the Chemical Society on March 18 on the subject of "New Methods in the Quantum Theory."

PROFESSOR CHARLES E. SCHUCHERT, of Yale University, gave several popular lectures on geology on March 18, 19 and 20 at the Texas Agricultural and Mechanical College, College Station, Texas. Following these lectures he planned to attend the annual meeting of the American Association of Petroleum Geologists at Dallas on March 25, 26 and 27.

PROFESSOR FLORIAN CAJORI, of the University of California, lectured on March 11 in Baton Rouge, at the Louisiana State University, on "The Development of Algebraic Notations," and on March 12 and 13 in New Orleans, at the Newcomb College, on "Women Prominent in the Mathematical Sciences," before the New Orleans Academy of Sciences on "The History of the Principle of the Conservation of Energy" and before the Louisiana and Mississippi section of the Mathematical Association of America on "Origins of Fourth Dimension Concepts."

AT the March meeting of the New York Electrical Society held in commemoration of the fiftieth anniversary of the invention of the telephone by Alexander Graham Bell, Dr. Colin G. Fink, of Columbia University, discussed the recent advances in the "Electrodeposition of Metals." The second speaker of the evening was Dr. F. F. Lucas, of the Bell Telephone Research Laboratories. With the aid of a series of microphotographs, Dr. Lucas reviewed his years of research on the application of the "Ultra-Microscope in Metallography."

PROFESSOR ANTON J. CARLSON, professor of physiology at the University of Chicago, lectured on the subject, "Organotherapy," on March 4, at the University of Michigan.

DR. WHEELER P. DAVEY, of the Research Laboratory of the General Electric Co., lectured on February 25 on "Crystals and Crystal Structure," before the Brooklyn Institute of Arts and Sciences.

ON March 13, Professor Francis E. Lloyd, of the department of botany at McGill University, Montreal, delivered an address to the Royal Canadian Institute under the following titles: 1. "Reproduction in Watersilk." 2. "A Voracious Appetite." Moving pictures taken with the microscope illustrated the lecture.

C. E. SKINNER, assistant director of engineering of the Westinghouse Electric and Manufacturing Company, addressed the Baltimore section of the American Institute of Electrical Engineers on March 19. His subject was "Mechanical Power and Trends of Civilization."

THE Sigma Alpha Chapter of the Sigma Pi Sigma Physics Fraternity of Davidson College, Davidson, N. C., held an open meeting on March 2. Dr. R. H. Lafferty, of Charlotte, N. C., addressed the fraternity on "The X-Ray and its Modern Applications."

H. A. GOSSARD, chief of the department of entomology at the Ohio Experiment Station at Wooster, died in December, following self-inflicted wounds.

PETER KLAPHAAK, assistant pathologist in the office of sugar investigations, U. S. Bureau of Plant Industry, died recently. Mr. Klaphaak was born and educated in Holland, and did post-graduate work at the University of Michigan.

J. WHYTOCK, first president of the Botanical Society of Edinburgh, died on February 1.

DR. ALFRED PEROT, of the École Polytechnique, Paris, and physical astronomer of the observatory at Meudon, died recently at the age of sixty-two years.

M. ADRIEN ROBERT, of the Sorbonne, secretary of the Zoological Society of France, died recently at the age of fifty-eight years.

DR. W. AUTENRIETH, professor of medical chemistry at Freiberg, has died at the age of sixty-three years.

DR. KAMIL J. LHOTAK, professor of pharmacology and pharmacognosy at the Charles University, Prague, died on January 27, aged fifty years.

ACCORDING to the *Official Record* of the U. S. Department of Agriculture, W. M. Mingee and J. A. McLemore, junior entomologists engaged in the eradication of the sweet-potato weevil in southern Mississippi, with headquarters at Picayune, were found dead in the road about six miles from Picayune, Miss., on the morning of February 19, under circumstances leading to the belief that they had been shot and robbed by liquor runners. They had been slain with buckshot. The truck in which they were riding was found in Hattiesburg, Miss., 60 miles northeast, apparently having been abandoned there by one of the criminals. Two suspects were arrested.

THE United States Civil Service Commission announces an open competitive examination for editor of scientific publications in the office of the secretary, U. S. Department of Agriculture. The entrance salary for this position is $3,000 a year. The examination is open to both men and women. The duties of this position will be to analyze the content of scientific and technical manuscripts; to determine the accuracy of the data given and the conclusions drawn; to suggest ways and means of improving the presentation from a literary standpoint and of strengthening the publication from a scientific standpoint, and to scrutinize typographical details of printing form and style.

THE seventh annual meeting of the American Geophysical Union and of its sections will be held April 29 and 30 in the building of the National Academy of Sciences and the National Research Council, Washington, D. C., with the exception noted below. April 29, 9:30 a. m. to 12:30 p. m., section of geodesy; 2:30 p. m. to 5:30 p. m., sections of volcanology and oceanography; 8:00 p. m. to 11:00 p. m., section of terrestrial magnetism and electricity (in the assembly room of the Administration Building, Carnegie Institution of Washington, 16th and P Streets, Northwest). April 30, 9:30 a. m. to 12:30 p. m., sections of meteorology and seismology; 2:30 p. m. to 5:30 p. m., general meeting of the union.

THE fourteenth annual meeting of the Eugenics Research Association will be held at Cold Spring Harbor, Saturday, June 26, 1926. This year the meeting will be held jointly with the annual meeting of the American Eugenics Society. Titles of papers should be sent to Dr. Harry H. Laughlin, secretary of the program committee of the Eugenics Research Association, Cold Spring Harbor, Long Island, N. Y., by April 15.

THE third annual meeting of British zoologists was held on January 9 in the rooms of the Zoological Society of London. Fifty-seven zoologists were present, and Professor Graham Kerr occupied the chair. The next meeting will be held on January 8, 1927.

WE learn from *Nature* that the Empire Council of Mining and Metallurgical Institutions, of London, on behalf of ten constituent bodies, has accepted the invitation of the Canadian Institute of Mining and Metallurgy to hold the second Empire Mining and Metallurgical Congress in Canada in August–September, 1927. The first Congress, from which the Empire Council arose, was held at the British Empire Exhibition, Wembley, in 1924, under the presidency of the late Viscount Long, of Wraxall.

THE Fourteenth International Geological Congress will be held in Madrid this year. The opening session, under the presidency of the King of Spain, will be on May 24. In addition to local excursions during the meeting, it has been arranged to visit, before and after the congress, places further afield, including the Balearic Islands, Morocco and the Canaries. Information may be obtained from the secretary of the organizing committee, Plaza de los Mostenses 2, Madrid.

ON February 17 members of the Columbia University chapter of Sigma Xi were guests of the scientific staff of the American Museum of Natural History for an inspection of the research laboratories of that institution. Dr. Henry Fairfield Osborn, president of the museum, made a brief address of welcome, following which the guests were divided into six groups and conducted through the laboratories, where members of the staff explained the work of each department and exhibited material under investigation or experiments in progress. The occasion was most fruitful in giving those present a better appreciation of the research activities of the museum, as distinguished from its educational work.

THE colleges and universities of southern California joined on February 27, in a geological excursion to the Elsinore trough, sixty miles southeast of Los Angeles. Professor William Morris Davis, of Harvard University, acted as leader. Dr. Davis had just completed, at Pomona College, his term as Har-

vard visiting professor for the western circuit of Grinnell, Colorado College and Pomona. The excursion was made by eleven instructors and twenty-three students from the Southern Branch of the University of California, the University of Southern California, Occidental College, California Institute of Technology, Pomona College and Riverside Junior College. There were also three guests.

THE 1926 program of the Astronomy and Physics Club of Pasadena has included the following: January 8—"Report on the Kansas City Meeting of the American Association for the Advancement of Science," Dr. Chas. E. St. John; January 15—"The Theory of Electrostatic Alternation," Dr. A. W. Simon; January 22—"Solar Variations and the Weather," N. W. Cummings; January 29—"Present Status of Stellar Interferometer Work," Mr. Francis G. Pease; February 5—"Reflection of Light from a Discontinuous Layer," Dr. Paul S. Epstein; February 12—"The Mount Wilson Experiment on Ether Drift," Dr. Dayton C. Miller; February 19—"Medical Applications of X-Rays," Dr. A. W. Simon; February 26—"The Life and Work of Augustus Fresnel," Dr. Paul S. Epstein; March 5—"Interferometer Measurements on Fine Structure of the Balmer Series," Dr. W. V. Houston, National Research Council.

THE Sigma Xi Alumni Association of the University of Pittsburgh heard the following program by the Oil and Gas School on February 25: "New Methods for appraising Oil Properties," Roswell H. Johnson. "An Investigation of the New Methods for extracting Petroleum," Ransom E. Somers. "The Oil Well Decline Curve," Leo C. Morgan. "Predicting Change of Price of Petroleum," Wm. Foraker. "Experimental Studies in the Flow of Fluids through a Porous Rock from two Entrance Points," Harold Hoffman (posthumous). "A New Barometer," I. Ivanoff.

THE Wollaston medal of the Geological Society of London was awarded to Henry Fairfield Osborn, now senior geologist of the United States Geological Survey, on February 19, as already noted in SCIENCE. President F. A. Bather, in his address of presentation of the medal through the American Embassy in London, concluded as follows: "During recent years he has directed a systematic search for fossils in the Cretaceous and Tertiary strata of Mongolia and large and important collections of previously unknown forms have been obtained, which he is now studying. Not his least service to science has been the foundation of a flourishing school of vertebrate paleontology, which already includes the names of a number of brilliant men of science, who are working in cordial cooperation under his inspiring leadership."

GOVERNOR HENRY L. WHITFIELD has signed the bill prohibiting teaching in state-supported schools of Mississippi that man "ascended or descended from a lower order of animals."

THE American Medical Association has begun the publication of a new special journal under the title *Archives of Pathology and Laboratory Medicine*. The first number appeared in January. The editorial board consists of the following: Ludvig Hektoen, Chicago; Simeon B. Wolbach, Boston; William Ophuls, San Francisco; James Ewing, New York; Alfred Stengel, Philadelphia; William G. MacCallum, Baltimore.

UNIVERSITY AND EDUCATIONAL NOTES

A NEW gift of $4,000,000 to Northwestern University for the use of the medical and dental schools has been made by Mrs. Montgomery Ward, of Chicago. About two years ago Mrs. Ward donated an equal sum for the same schools. The Montgomery Ward Memorial Building, on the McKinlock Memorial campus, is being constructed with the aid of the fund.

IT is announced that the University of Chicago has raised $7,500,000 of the $17,000,000 development fund which the university is attempting to raise.

JUDD HALL, Wesleyan University, will be remodeled soon to provide better and adequate facilities for the departments of biology and geology. This move is made possible by the removal of the department of chemistry to the new Hall laboratory of chemistry, which is now rapidly nearing completion.

ON March 15 ground was broken for the new botany building of the college of science, literature and the arts of the University of Minnesota, to be erected and equipped at a cost of $225,000.

THE Rockefeller Foundation has granted 3,000,000 francs to the faculty of medicine of Strasbourg to build an institute of histology and an otolaryngologic clinic and to subsidize research workers.

JAMES M. CORK, assistant professor of physics at the University of Michigan, will join the staff of the University of Manchester as exchange professor during the next school year, while J. M. Nuttall, senior lecturer and assistant director of the physical laboratories of that university, will come to Michigan.

DR. GEORGE P. CLINTON, lecturer on forest pathology in the Sheffield Scientific School, Yale University, has been appointed research associate in the university with professorial rank.

DR. G. V. ANREP has been appointed to a readership in physiology at the University of London, tenable at University College.

AT the University of Pisa, the office of rector has passed from the hands of Professor D'Acchiardi to Professor Vittorio Aducco, director of the Institute of Physiology.

DISCUSSION AND CORRESPONDENCE

THE LIFE HISTORY OF A FAKE!

JUST twenty-three years ago there occurred at this place an episode which may be taken as a typical example of the persistence of error, even in spite of pains to correct it. This is brought vividly to my attention by a letter just received, asking for information concerning the occurrence in Onondaga Lake of marine squids, citing a reference to it in Price's "The New Geology" where (page 584) the following statement occurs: "Lake Onondaga, once a part of Lake Ontario, contains marine squids." And this is but one of a number of such inquiries within recent years. It seems well, therefore, in the interest of scientific verity, to submit a brief review of this case, hoping to contribute thereby toward an end of an unfortunate error.

At that time a specimen was brought to me which was reported to have been captured in this lake. Fortunately, I had at command specimens of this animal which were used in the biology laboratory, and placing one before the reporter, asked him to compare his own specimen with it. "As you will see, these specimens are very closely alike, but mine came from the sea coast of Massachusetts. They are never found in fresh waters or in lakes such as Onondaga." He was not satisfied, however, with my version, so consulted Principal John Wilson, of Syracuse, a geologist whom I knew well and esteemed highly, and told him the same story as to me. Knowing well the geology of the salt deposits which were located in this section, Mr. Wilson was at once interested in the matter and promised to investigate it. The reporter was too eager, however, to get a good story, so did not wait for investigation, and in consequence, the city papers contained marvelous announcements of a great find of marine animals in Onondaga Lake!

Mr. Wilson also reported the case to Dr. J. M. Clarke, state geologist, giving him such accounts as he had been able to glean. Clarke immediately reported the matter to SCIENCE, where it appeared December 12, 1902, page 947. The present writer immediately communicated with Dr. Clarke touching the matter and assured him that the case was entirely too "fishy" to warrant the publicity which he had given to it and called his attention to the fact that the implications that these specimens were taken alive were unfounded and giving facts which strongly discounted that view. Attention was called to the place and time where the specimens were found, to the statements of Mr. Wilson that the restaurant at the iron pier at this season served as a specialty baked clams, chowder, raw and cooked oysters, etc., continuously. It was well known that these supplies were obtained from the sea coast, packed in barrels, the specimens covered with masses of seaweed which supplied moisture during the shipment to Syracuse. It was also noted that the débris from these shellfish was dumped into the lake. The writer thinks it highly probable that in this packing stuff and débris which went into the lake were perhaps incidentally these vagrant specimens of squids.

Clarke later sent a specimen for critical investigation and report to Dr. A. E. Ortmann, of Princeton University, a curator of invertebrate paleontology. His investigations and conclusions were reported in SCIENCE for January 2, 1903 (page 30), in which he states that the specimen proves to belong to the well-known species of our northeastern Atlantic coast; "the cold water, or short-finned squid. The specimen has been compared with the description given by Verrill, and with the well-preserved specimens (male and female) of this species from Provincetown, Massachusetts, preserved in the collection of the Museum of Biology, Princeton University." Therefore he arrived at the conclusion that "the present individual is in no wise different from *Illex illecibrosus* of our northeastern coast, a species abundant from Cape Cod to Newfoundland."

Concerning the matter of the species living in Onondaga Lake, Ortmann says:

> I am loth to believe that the species lives in the lake. In this connection I venture only one suggestion; this squid is largely used for bait, and the capture of squids forms a regular trade on our northeastern coast. Could it not be possible that somebody secured by purchase a barrel of squid to be used for bait in this locality where our specimen was found?

To conclude: So far as the present writer is aware, this error gained currency chiefly through geologic channels; first, in the hasty and misleading announcements of the state geologist, whose experience and official station should have prompted caution. Second, Pierson and Schuchert's "Text-book of Geology," 1915, page 493, and in a later edition (1920), page 493, under the heading "Relic Seas and Lakes," states "Squids are still present, though rarely, in Lake Onondaga, once a tributary of Lake Ontario." In Lull's "Organic Evolution," 1917, page 79, the case is cited apparently from these sources. The citation by Price (above) is probably from this source

also. Why Clarke's note of the case should have been given wide currency, while the clear and convincing report of the case by Ortmann was overlooked or disregarded, is the amazing aspect of this very crude "fake." Is it possible that the present exposé, twenty-three years afterward, may be more effectual? Surely its life history has been extreme!

CHAS. W. HARGITT

SYRACUSE UNIVERSITY

THE S. T. DARLING MEMORIAL PRIZE

THE news of the tragic death of Dr. S. T. Darling, the eminent American malariologist, is fresh in the minds of many of your readers. It will be recalled that the fatal motor accident resulting in his death and that of two other members of the party occurred in Syria, in May, 1925, where Dr. Darling, as a member of the malaria commission of the Health Organization of the League of Nations, was studying local malaria conditions.

The health committee of the League of Nations during its last session adopted the following resolution which has since received the approbation of the council of the league:

> The Health Committee, wishing to honour and perpetuate the memory of Dr. Darling, decides to collect by private subscription a capital fund, the interest on which will be expended on a prize to be awarded periodically. This will be known as "The Darling Prize."
>
> The prize (a medal or other award) will be awarded by the malaria commission of the League of Nations to the scientist who, in its opinion, has carried out recent distinguished research work on a subject connected with malaria which comes within the general scope of the commission's investigations.

Should any of your readers desire to be associated with this attempt of the Health Organization of the League of Nations to honor the memory of a distinguished American colleague by subscribing to the fund, I would ask that their contributions be sent to the director of the Health Section, League of Nations, Geneva, Switzerland.

Contributions will be acknowledged individually and all subscribers will be given, in due course, full information as to the regulations governing the periodic award of the prize and the administration of the funds.

TH. MADSEN,
President of the Health Committee.

SPECIAL CHARACTERS FOR THE TYPEWRITER

IN the discussion on simplified literature citations in the issue of SCIENCE for January 15, Mr. Charles F. Goldthwait, of the Mellon Institute of Industrial Research, University of Pittsburgh, says:

> In manuscripts for printing, bold-faced type is indicated by underlining with a wavy line. Since the typewriter has no such character, editors understand what is meant if volume numbers are underlined.

I had so much difficulty along this same line that I had made for my typewriting machine a special character—a wavy underscorer which, when the machine is run back and this character is used to underline the letters or figures wanted in blackface, gives a continuous wavy line which the printer readily understands.

I also have a special character with two parallel lines which will underscore the words desired in small caps. When this is used with the regular underscorer, it gives me the three lines required to indicate capitals.

Also, I had my machine equipped with brackets as well as parentheses.

I had this done over ten years ago when I was an editor-in-chief on the late John Hill's group of engineering weeklies, and at that time and in all the years since I have found these special characters among the handiest on my machine, enabling me to turn out clean and properly marked copy.

EDWARD PIERCE HULSE

DISTRIBUTION OF HYMENOPHYSA PUBESCENS

IN the issue of SCIENCE for December 4, 1925, Paul C. Standley reported the finding of *Hymenophysa pubescens* in the United States. He stated that this plant was new to the United States and the American herbaria lacked specimens. I wish to correct this error by calling your attention to my finding of this plant at Ypsilanti, Michigan, in 1919. It was identifed by Harold St. John, formerly at Gray Herbarium, Cambridge, Massachusetts. Specimens are to be found in the following herbaria: Gray, Cambridge, Massachusetts; Parke, Davis and Company, Detroit, Michigan; Field Museum, Chicago, Illinois; University of Michigan, Ann Arbor, Michigan; Michigan State College, East Lansing, Michigan, and many others in the United States.

B. A. WALPOLE

MICHIGAN STATE COLLEGE

QUOTATIONS

A BRITISH SCIENCE NEWS SERVICE[1]

UNDER the auspices of the British Association and the British Science Guild, a conference was recently

[1] From *Nature*.

held to consider the advisability of establishing a science news service in Great Britain, and after discussion a small committee was appointed to carry the matter further. For some time such a service has existed in the United States, and the success achieved in that country encourages the belief that there is room in British newspapers also for accurate information on scientific subjects, narrated in such a manner as to be interesting to the average educated but unscientific reader. Matter which is suitable for the American reader is not necessarily suitable for the British: each nation has its own idiom and its characteristic outlook. But what American science can do for America, British science should be able to do, in its own appropriate way, for Britain. Already the *Morning Post* and one or two other British papers make a feature of admirable reports on scientific subjects, while a few specially gifted men of science are doing excellent work by furnishing the press with informative articles: but apart from these exceptional cases it is a commonplace that the great majority of newspapers fail to distinguish between science and magic in anything but name, that the space they allot to science, as distinct from sensational charlatanism, is negligible, and that such paragraphs as they do devote to scientific topics are for the most part meaningless and in many cases untrue. The sporadic efforts of a few gifted journalists are not adequate to meet the situation. What is needed is a systematic supply of news the accuracy of which shall be guaranteed by recognized scientific organizations, while its form renders it easily digestible by at least the better educated newspaper readers.

* * * * *

The committee which has been formed will be confronted with a number of difficult problems, which will have to be solved before success can be achieved. Perhaps one of the most difficult will be that of guarding the news against mutilation by unscientific sub-editors. On the other hand, there is little to be feared from the alleged hostility of the pioneer journalists who are already in the field. It is to the interest of all concerned to cooperate in creating an increased demand for science news, and it is therefore reasonable to hope that the parties in the case will agree to pool their assets, which are, on one side, experience and an established reputation, on the other, the prestige of scientific authority.

Without the willing assistance of scientific workers and institutions, no organization for the preparation and distribution of science news can possibly be successful, and even with it, there is little hope that the agency would be self-supporting for several years. As regards finance, it may be mentioned that the American service pays for itself to the extent of about 60 per cent. of its expenses, the remaining 40 per cent. being provided by endowment. It has been estimated that a British service, selling news at standard rates, would need an endowment of at least £5,000 to ensure its being able to run for three years, at the end of which time it should be possible to decide whether the support secured was sufficient to justify the continuance of the service. One of the questions before the committee which has been set up is that of the possibility of raising this sum by contributions from public-spirited donors or other sources. It is unnecessary to discuss here the contrivance of machinery for obtaining and supplying news, but on the assumption that this and the other tasks confronting the committee can be successfully carried out, the scheme in its broad outline is one which must commend itself to every man of science who appreciates the significance of the discipline with which he is associated.

C. W. H.

SCIENTIFIC BOOKS

Astronomical Physics. By F. J. M. STRATTON. New York, E. P. Dutton and Company.

WHILE "Astronomical Physics," by F. J. M. Stratton, can not be recommended for light reading to one unversed in the background and general principles underlying the subject of astrophysics, in it every student in this and related fields will find much in the way of information and considerably more in the way of inspiration. It distinctly fills a long-felt need in its field.

The treatise is advertised as "a condensed account of modern views of the physical conditions that obtain in the stars." Especial emphasis should be placed upon "condensed" and "modern." In his attempt to present the subject in but 181 pages of text, the author was forced to limit his descriptions of early work, instruments and methods of attack to bare statements, and to present much of the modern work in little more than outline form. In all parts of the book, however, copious references to sources of information are given and the student who consults the articles cited should obtain a comprehensive insight into the present state of our knowledge of the subject.

The subject-matter is up to date, in so far as present-day rapid developments in the study of stellar physics permit. Successive chapters are devoted to the more productive instruments, to the laboratory investigations leading up most effectively to the interpretation of stellar conditions, to the sun, solar system, stellar radiation, radial velocities, stellar classification, giant and dwarf stars, nebulae, novae,

variable stars, stars with peculiar spectra and cosmogony. The chapters on the sun and stellar classification are more extensive and more nearly complete than the others, and properly so, and they are essential to the interpretation of the physical characteristics in the stars. These interpretations are based largely upon the Bohr theory of the construction of the atom, with its application to the study of thermal ionization by Saha, and the latest researches of Jeans and Eddington on stellar evolution. The author is to be commended for the manner in which only the essential facts and the more generally accepted theories are presented and for his discrimination in the presentation of points under controversy. In fact, one could wish that the author's own comments upon some of these subjects had been more extensive.

In eight appendices the author has collected a considerable amount of data, most of it relating to wave-lengths, in a form and place for handy reference. It should be pointed out, however, that the international secondary and tertiary standard wave-lengths given in Appendicies IV and V have already been shown to be affected by appreciable systematic errors and have been largely superseded by new values. The corrections are small but of sufficient size to become important in refined investigations.

The illustrations have been selected with discrimination and are exceptionally well reproduced. They effectively enhance the value of the book. With its condensed form, its excellent outline and its copious system of references, "Astronomical Physics" is to be highly recommended to the student and teacher as a text-book and to the investigator as a handy and inspiring work of reference.

RALPH E. WILSON

DUDLEY OBSERVATORY,
ALBANY, N. Y.

Bats, Mosquitoes and Dollars. By CHARLES A. R. CAMPBELL. 1925. Boston, The Stratford Co. viii + 3+1-262 pp., numerous illustrations.

THIS book sets forth (pp. 36–175) the personal views of its author respecting the supposed service of bats in the control of malaria by feeding upon malarial mosquitoes. The remainder of the volume deals with dragon flies, bedbugs and smallpox, and the function of the spleen. For more than fifteen years Dr. Campbell has been interested in the construction of "bat roosts" designed to house colonial bats, particularly *Nyctinomus mexicanus*. Following the construction of a successful roost at Mitchell Lake near San Antonio, Texas, he has been instrumental in having other "roosts" erected near San Antonio, at Gulfport, Texas, at Tampa, Florida, and in Italy on the Pontian Marshes and in Terracina. The author has devoted much time to studying the habits of bats, in and about the limestone caves of Texas and at the bat roosts, and the book sets forth in considerable detail his experiences with bats and in the construction of the roosts. No details are given as to the manner of construction of the roosts, as these have been patented by the author. Among the suggestive items mentioned in the text are the following: That bats, upon arriving in the vicinity of their abode, seem to follow down the ammonia-laden currents of air arising from the roosts; that chemical changes in the guano masses of caves sometimes lead to spontaneous ignition of the accumulations in the larger caves; that bats have been captured by "chicken hawks," by sparrow hawks, and on one occasion a barn owl took to capturing bats at the Mitchell Lake roost; that individual bats, marked with chalk and released at a distance of twenty-eight to thirty miles from their home roost, returned "home" in as short a time as fifty-eight minutes.

Unfortunately, the subject-matter of the book can not be relied upon in many places. As the reviewer will shortly show elsewhere the fundamental premise, that bats feed upon mosquitoes, remains to be verified. No satisfactory evidence on this important subject is adduced in the volume under discussion. The book abounds in non-critical "depositions" and "testimonials" from many sources, ranging from illiterate Mexicans to various medical organizations. The nature of much of the contents may be indicated by one illustration—that of the gold pen with which the governor of Texas signed the bill protecting bats in that state.

The reviewer has no desire to criticize the book save in the interests of scientific accuracy. Would that the author were right in the supposed service of bats in suppression of mosquitoes! The entire world, scientific and lay, would welcome any additional agency in the suppression of mosquitoes or malaria.

Some computations on pages 249 to 251 relative to the amount of iron in guano and the consequent amount of human blood used as mosquito food would be alarming if true, but since they are founded on the supposed mosquito diet of bats they are of no significance. Furthermore, the blood and tissues of insects contain certain small amounts of ferric salts (as also phosphorus which figures prominently in the value of bat guano as fertilizer) and this is not allowed for sufficiently in the computations.

Naturalists are under considerable obligation to Dr. Campbell for his services in attempting to correct some of the popular misconceptions concerning bats, for his efforts in having bats protected by law in San Antonio and in Texas, and for his ingenuity

in developing a practical bat roost which can be colonized with bats and from which an annual "crop" of guano, of considerable monetary value, can be gathered. Our one important criticism would be that emphasis should be directed, not to the supposed service of bats in mosquito control, but to the fact that they feed upon night-flying insects, especially noctuid moths, many of which, in their larval stages, are important agricultural pests.

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SPECIAL ARTICLES

APPLICATION OF THE GENERIC NAME PHYLLOCOENIA MILNE EDWARDS AND HAIME AND THE INTERNATIONAL CODE OF ZOOLOGICAL NOMENCLATURE

IN my paper on the "Fossil Corals from Central America, Cuba and Porto Rico," I pointed out that the generic name *"Phyllocoenia"* of Milne Edwards and Haime must be placed in the synonymy of *Orbicella* Dana, because the type species of *Phyllocoenia, P. irradians* Milne Edwards and Haime, is referable to the genus *Orbicella* Dana, 1846, type species *Madrepora annularis* Ellis and Solander.[1] Professor J. Felix has just published the paper cited below,[2] in which he agrees with me that *Phyllocoenia irradians* belongs to *Orbicella,* but he retains the name *Phyllocoenia* for species of corals which are not congeneric with the type-species of the genus. This procedure is not permissible under the rules of the International Code of Zoological Nomenclature. The following are three quotations from the International Rules of Zoological Nomenclature adopted by the Ninth International Zoological Congress at Monaco in 1913:

> If a genus is divided into two or more restricted genera, its valid name must be retained for one of the restricted genera. If a type was originally established for said genus, the generic name is retained for the restricted genus containing said type.[3]
>
> When in the original publication of a genus, one of the species is definitely designated as type, this species shall be accepted as type, regardless of any other consideration.[4]
>
> If an author, in publishing a genus with more than one valid species, fails to designate (see *a*) or to indicate (see *b, d*) its type, any subsequent author may select the type, and such designation is not subject to change. (Type by subsequent designation.)[5]

Milne Edwards and Haime in 1848 at their original publication of *Phyllocoenia* cited *P. irradians* as an example of the genus, and in 1850 definitely designated *P. irradians* as the type-species.

No coral that does not agree generically with *Phyllocoenia irradians* may receive the generic designation *Phyllocoenia,* which by its type-species is a synonym of *Orbicella.*

Professor Felix in his paper cited makes an important contribution to the morphology of the hard parts of certain Triassic and Upper Cretaceous corals which *have been erroneously referred to Phyllocoenia.* These species must receive another generic designation, if they all belong to the same genus; or other generic designations, if they represent more than one genus.

One of the striking defects of the work of many paleontologists is that it does not conform to the rules of the International Code of Zoological Nomenclature. There are so many errors in many of the publications that I have occasion to read that I have wished to analyze the nomenclature in a number of papers to show why the names can not stand. Pressure of other work has rendered undertaking the task impracticable; but a few glaring failures to comply with the rules will be mentioned.

Munier-Chalmas in 1891 proposed the generic name *Orthophragmina* for certain foraminifera for which at least five previously published names were available, which is in conflict with Article 28 of the code:

> A genus formed by the union of two or more genera or subgenera takes the oldest valid generic or subgeneric name of its components. . . .[6]

H. Douvillé has proposed *Isolepidina* as a subgenus of *Lepidocyclina* and designated as the type-species of *Isolepidina* the type-species of *Lepidocyclina, L. mantelli* (Morton) Gümbel; and he has proposed *Orbitella* as a substitute for *Oribtoides* s.s. and included in it *Orbitoides media* (d'Archiac) d'Orbigny, which is the type-species of *Orbitoides.* The names *Isolepidina* and *Orbitella* must lapse. The first is in conflict with Article 9 of the Code:

> If a genus is divided into subgenera, the name of the typical subgenus must be the same as the name of the genus.[7]

The second name, *Orbitella,* conflicts with the rules quoted as notes 3 and 5 of this paper.

Many eminent paleontologists have committed and are committing errors of the kind indicated above. It is a great pity that any scientific work should

[1] Vaughan, T. W., U. S. Nat. Mus. Bull., 103, pp. 363, 394, 395, 1919.

[2] Felix, J., "Ueber die Gattung Phyllocoenia," *Centralbl. für Min.,* etc., Jahrg., 1925, pp. 363–368.

[3] IXe Cong. Internat. Zool., Art. 29, p. 902.

[4] *Op. cit.,* Art. 30, *a,* p. 29.

[5] *Op. cit.,* Art 30, *g,* p. 903.

[6] *Op. cit.,* pp. 901–2.

[7] *Op. cit.,* p. 897.

need revision other than that caused by progress in knowledge. The investigations of Professor H. Douvillé on the morphology of the tests of the larger foraminifera are almost certainly the best that have yet been made—his work is classic—but this will not prevent the necessity of having to revise his nomenclatorial treatment of the organisms he has studied so profoundly.

Strict adherence to the rules of the International Code of Zoological Nomenclature in paleontologic publications is a fundamental necessity, for unless this is done there will be perpetual instability in paleontologic nomenclature.

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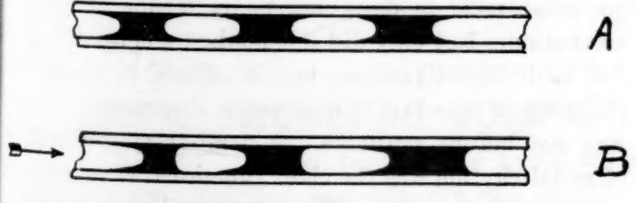
A NEGLECTED CAPILLARITY EFFECT

THE principle of the phenomenon of the "chaplet of drops," due to Jamin, is simple. The annexed figure shows glass tubes containing series of water drops separated by air bubbles. With both ends open to the atmosphere as at A the drops and the bubbles are symmetrical, but at B, the air in the left-hand end of the tube being under pressure, the symmetry is disturbed and in consequence of the different curvatures of the left and right ends of each drop there is a resultant force from right to left. With a sufficient number of drops in a tube of fine bore Jamin found that the force was great enough to resist a pressure of several atmospheres.

Thinking that possibly the Jamin effect might be responsible for some of the numerous cases of engine failure which have caused airplane disasters the author has made experiments with chaplets of water drops in gasoline.

Many methods were tried for introducing the chaplet of drops into a glass tube, the simplest proving to be a suction method. The capillary tube, one end of which is drawn out to a fine jet and crooked at right angles, is laid flat upon a table. A bracket fixed to the left-hand end of the table supports a beaker which is thus held just below the level of the table. The crooked end of the capillary tube reaches



nearly to the bottom of the beaker, which is filled, the lower half with water and the upper half with gasoline. A rubber pipe is fitted tightly over the open end of the capillary tube so as to form a straight extension to that tube. In order to draw up liquid from the beaker into the capillary tube a wooden roller is laid across the rubber pipe and rolled along from left to right. Water is drawn up when the jet is at the bottom of the beaker, gasoline when the jet is raised.

It is important to draw out the end of the tube into a fine jet, since otherwise a water-spout is apt to form between the water below and the gasoline above.

The following is a brief summary of results obtained:

(1) The head of water supported by a water-gasoline chaplet in a glass tube of given bore is about constant for a given number of drops no matter what are the lengths of the drops.

(2) Between the limits of ten and thirty drops the head supported by a chaplet is roughly proportional to the number of drops.

(3) The head supported by a given number of drops is inversely proportional to the diameter of bore of the tube.

(4) The head supported per ten drops of ordinary gasoline (Texaco brand) in a glass tube of 1.5 millimeter bore is about five centimeters of water. Thus a chaplet consisting of thirty drops of gasoline alternating with twenty-nine drops of water supports a head of about fifteen centimeters of water.

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THE thirteenth annual meeting was held at Cleveland, from December 28 to 30, 1925, in conjunction with the Federation of American Societies for Experimental Biology. Dr. George H. Whipple, of Rochester, New York, presided.

Among the interesting papers was a communication by Dr. George H. Whipple, on "The Hemoglobin of Striated Muscle," in which he showed that there was a considerable variation in the hemoglobin content of muscle which, however, can not be robbed by anemia's demands. It is obvious that muscle hemoglobin is of importance whether one studies the end products of hemoglobin disintegration or the parent substances suitable for construction into mature hemoglobin; also that muscle hemoglobin must be considered in any study of body pigment metabolism.

Drs. H. Cushing and S. J. Maddock produced an experimental obstruction of secretion from the Pars Nervosa of the Pituitary by means of small metal clips. Marked changes in the posterior lobe, with the production of diabetes insipidus, indicated that the pituitary was intimately involved in this condition.

Two papers by Drs. Lucke and McCutcheon, on "The Kinetics of Osmotic Swelling in Arbacia Eggs," and the effect of P^H, showed that as long as the cell is uninjured the Donnan equilibrium such as occurs in erythrocytes is not established in these cells. They concluded that the rate of swelling is affected by processes of unknown nature in the semipermeable membrane of the cell, which modify the effect of diffusion.

Drs. S. A. Schlueter and I. F. Weidlein presented a method for the experimental production of lung abscess, by allowing the infective element to reach the lung tissues via the blood stream in the form of a septic embolus.

Studying reversed passive anaphylaxis, Dr. Eugene L. Opie and J. Furth made the important observation that the meeting of antigen and antibody is sufficient to produce anaphylactic shock, irrespective of the order of their introduction into the body, although an interval of approximately four hours must intervene between the injection of the antigen and antiserum. The authors believe that the precipitate formed by the precipitin and precipitinogen may be at the base of the reaction and that it is unnecessary to assume the explosive formation of a toxic substance.

In a study of fowl paralysis, Dr. A. M. Pappenheimer and his associates found characteristic lesions in the peripheral nerves, dorsal ganglia and nerve roots, with degenerative changes in the nerve trunks in the later stages. No parasites were demonstrated and the experiments to determine transmissibility have not as yet led to positive conclusions.

Syphilitic myocarditis was reported by Drs. Wade H. Brown and Louise Pearce, in six routine post-mortem examinations of experimental animals, although treponemata were not demonstrated. These were said to be the first cases of syphilitic myocarditis or visceral syphilis reported in the rabbit.

Studying the amount of specific toxin found in the blood of 144 cases of scarlet fever, Drs. F. G. Blake and J. D. Trask found as high as 350 skin test doses in severe cases, and from twenty-five to one fourth skin test doses in the moderate cases. In the average case the specific toxemia fell at the end of the first week; and in septic cases in the second or third week.

Dr. Carl V. Weller succeeded in producing symmetrical lead gangrene in guinea pigs by the administration of large doses of white lead only when given in carefully spaced intervals. The character of the lesions was that of a symmetric ischaemic dry gangrene.

By means of a modified celloidin injection and corrosion technique, Drs. McIndoe and V. S. Counsellor secured beautiful specimens of the intra-hepatic vascular and biliary trees. This method brought out that in marked portal cirrhosis the disturbance was mainly in the smaller branches of the portal and hepatic veins. In biliary obstruction enormous dilatation of the ducts resulted, resembling the condition seen in hydronephrosis and bronchiectasis.

Injecting egg albumen intravenously into adrenalized rabbits, Drs. W. J. M. Scott and H. S. Thatcher found that pulmonary emboli occurred in a high percentage but practically never in the controls. They did not attempt an explanation of the mechanism involved.

An interesting paper on the splanchno-peripheral autonomic balance by Drs. Petersen and E. F. Muller would have to be consulted in the original, as it does not lend itself to presentation in abstract.

New evidence of the potential immortality of mammalian tissues was presented by Dr. Leo Loeb. He found that cartilage tissue alone withstands the various body reactions to transplantation. He has therefore been able to carry transplanted cartilage of rats for five or six years, *i.e.*, several times the average length of life for a rat.

The influence of adrenalectomy on the susceptibility to tetanus toxine in white rats was investigated by Drs. J. M. Rogoff and E. C. Ecker. No difference, however, could be demonstrated. Local tetanus appeared in both adrenalectomized and unoperated rats after about the same period and the same amount of tolerance to given doses was found.

Drs. Jessie M. Gottesman and Henry L. Jaffe, studying the histogenesis of autoplastic thymus transplantation in the rat, found that the transplants undergo destructive changes which begin within a few hours and reach their height in about two days. Regenerative changes then begin, which are characterized by proliferation of the reticular cells, and during the third day the small thymic cells appear. Regeneration is usually complete by the fourteenth day, when the new-formed lobules are differentiated into cortical and medullary zones.

Drs. M. C. Borman and T. H. McMillan studied for the first time the gradual destruction of the sino-auricular node in dogs' hearts by means of radium emanation. Not only did this method seem well suited for such investigations, but it offered a means of studying a gradual progressive destruction which was not before available. A temporary production of nodal rhythm was the chief functional change noted in partial destruction. The specialized sinus node tissue seems particularly susceptible to the degenerative effects of radium.

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Secretary.